

Modified Root Zone Routine in IWFM v2.4

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IWFM Users Group Meeting

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BACKGROUND:

- Initial findings of C2VSIM calibration:
 - Declining groundwater levels
 - Not enough recharge to the aquifer
 - IWFM was not sensitive enough to the hydraulic conductivity of the root zone
 - Monthly simulation time step combined with the root zone moisture routing scheme in IWFM v2.3 generated too much return flow, too little deep percolation
- Based on the findings, root zone moisture routing scheme was modified and incorporated into IWFM v2.4



Root Zone Scheme in IWFM v2.3

- Mass balance equation (Eq.3.87, IWFMv2.3 Theoretical Doc):

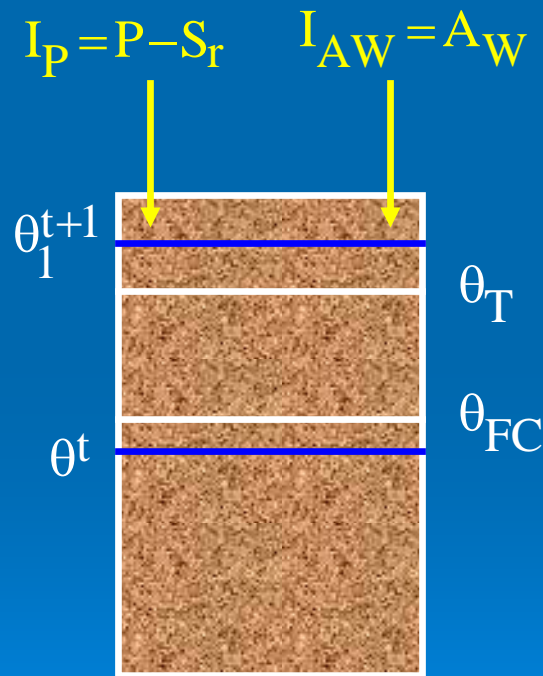
$$\theta^{t+1} = \theta^t + \left[(P - S_r) + (A_w - R_f) - ET - D_p \right] \Delta t$$

- Order of computation of flow components:
 - Runoff from precipitation, S_r
 - Infiltration of applied water (all applied water initially assumed to infiltrate)
 - Return flow, R_f , and adjusted runoff from precipitation if soil moisture content is above the total porosity
 - ET
 - Deep percolation, D_p



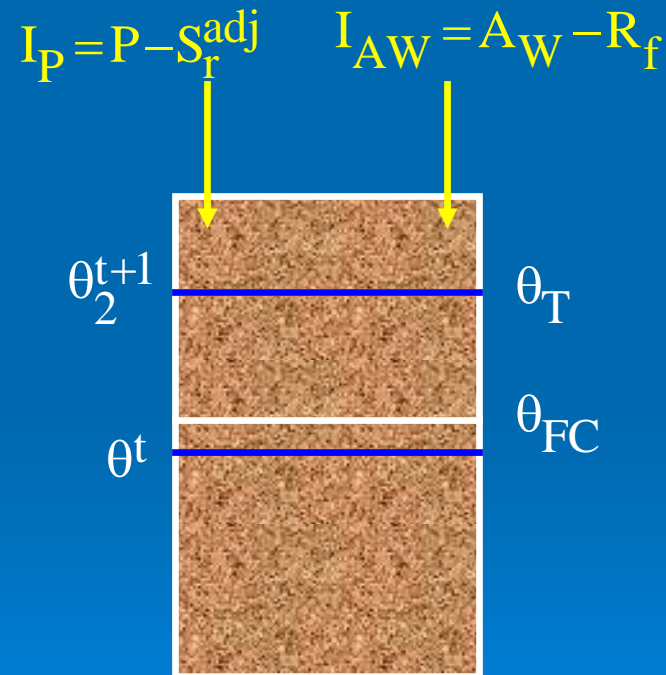
Root Zone Scheme in IWFM v2.3 (*continued*)

Step 1: Compute initial estimates of infiltration and soil moisture



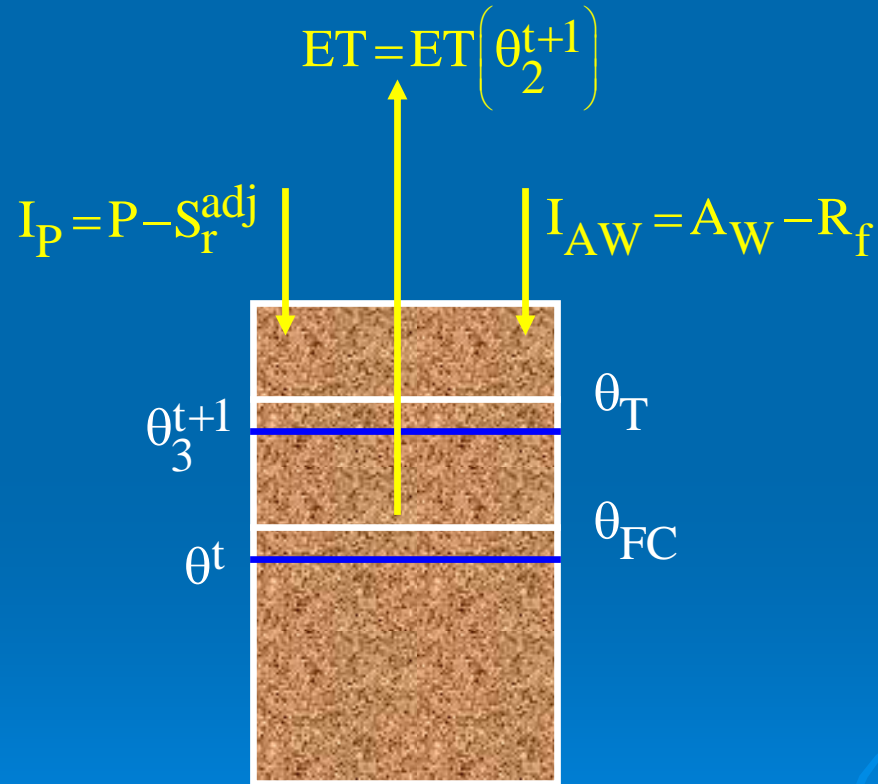
Root Zone Scheme in IWFM v2.3 *(continued)*

Step 2: Compute adjusted surface runoff and soil moisture;
this is the step that limits the deep percolation!



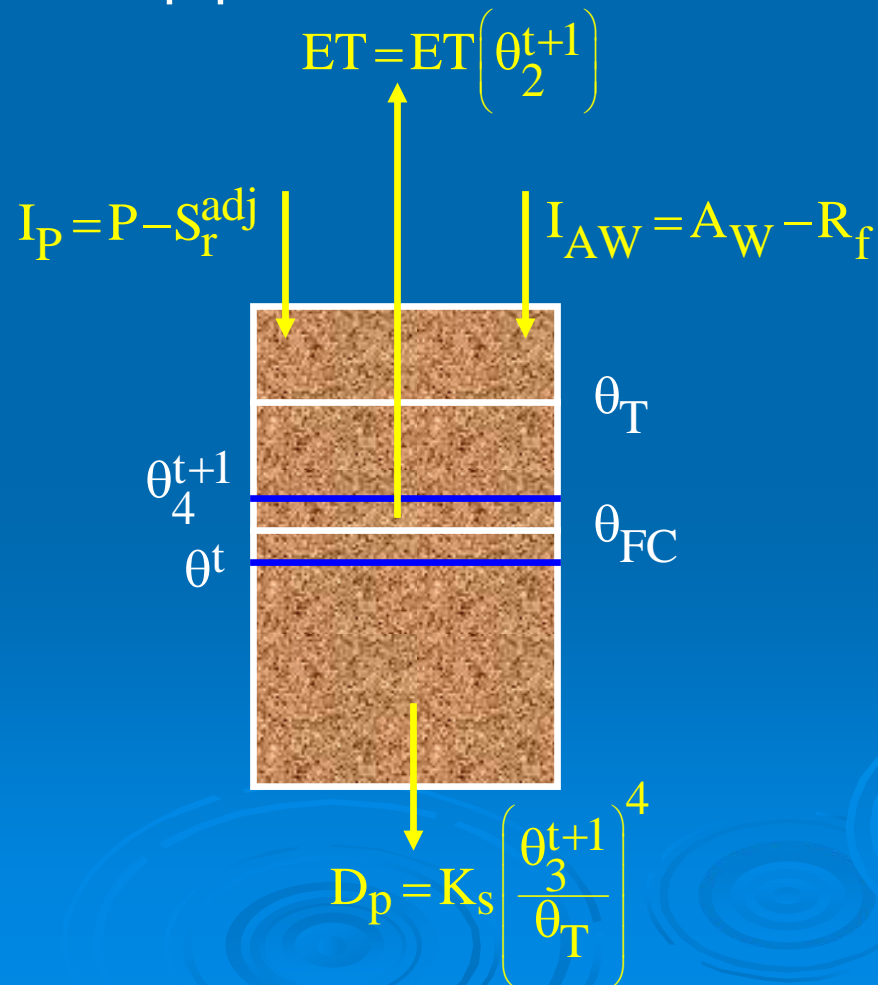
Root Zone Scheme in IWFM v2.3 *(continued)*

Step 3: Compute ET



Root Zone Scheme in IWFM v2.3 *(continued)*

Step 4: Compute deep percolation



Modified Root Zone Scheme in IWFM v2.4

- Mass balance equation (Eq.3.87, IWFMv2.3 Theoretical Doc):

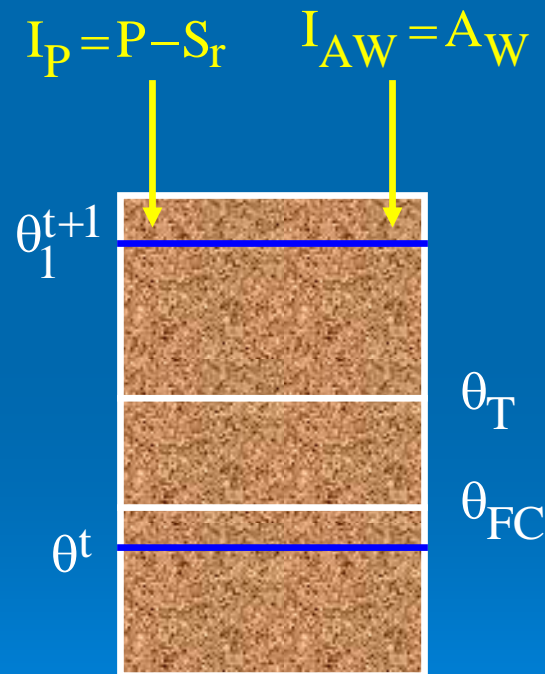
$$\theta^{t+1} = \theta^t + \left[(P - S_r) + (A_w - R_f) - ET - D_p \right] \Delta t$$

- Order of computation of flow components are modified:
 - Runoff from precipitation, S_r
 - Infiltration of applied water (all applied water initially assumed to infiltrate)
 - ET
 - Deep percolation, D_p , and return flow, R_f
 - Adjusted runoff from precipitation if soil moisture content is above field capacity



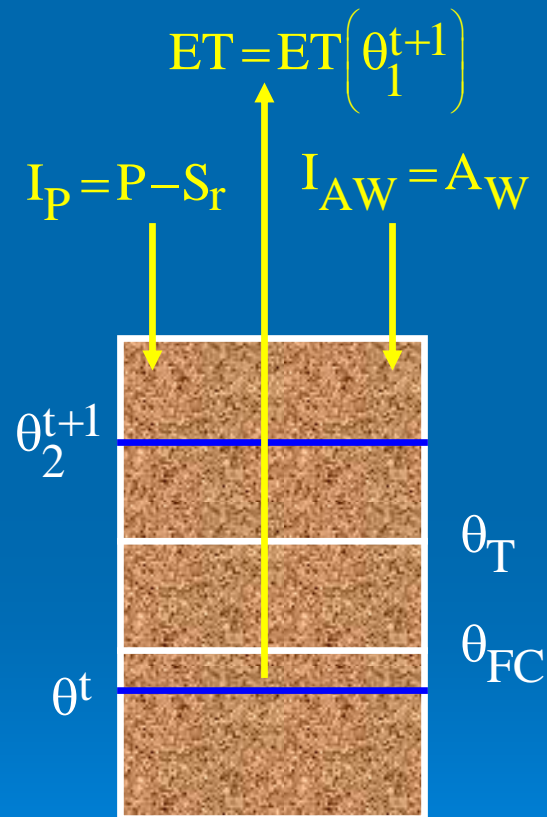
Modified Root Zone Scheme in IWFM v2.4 (continued)

Step 1: Compute initial estimates of infiltration and soil moisture



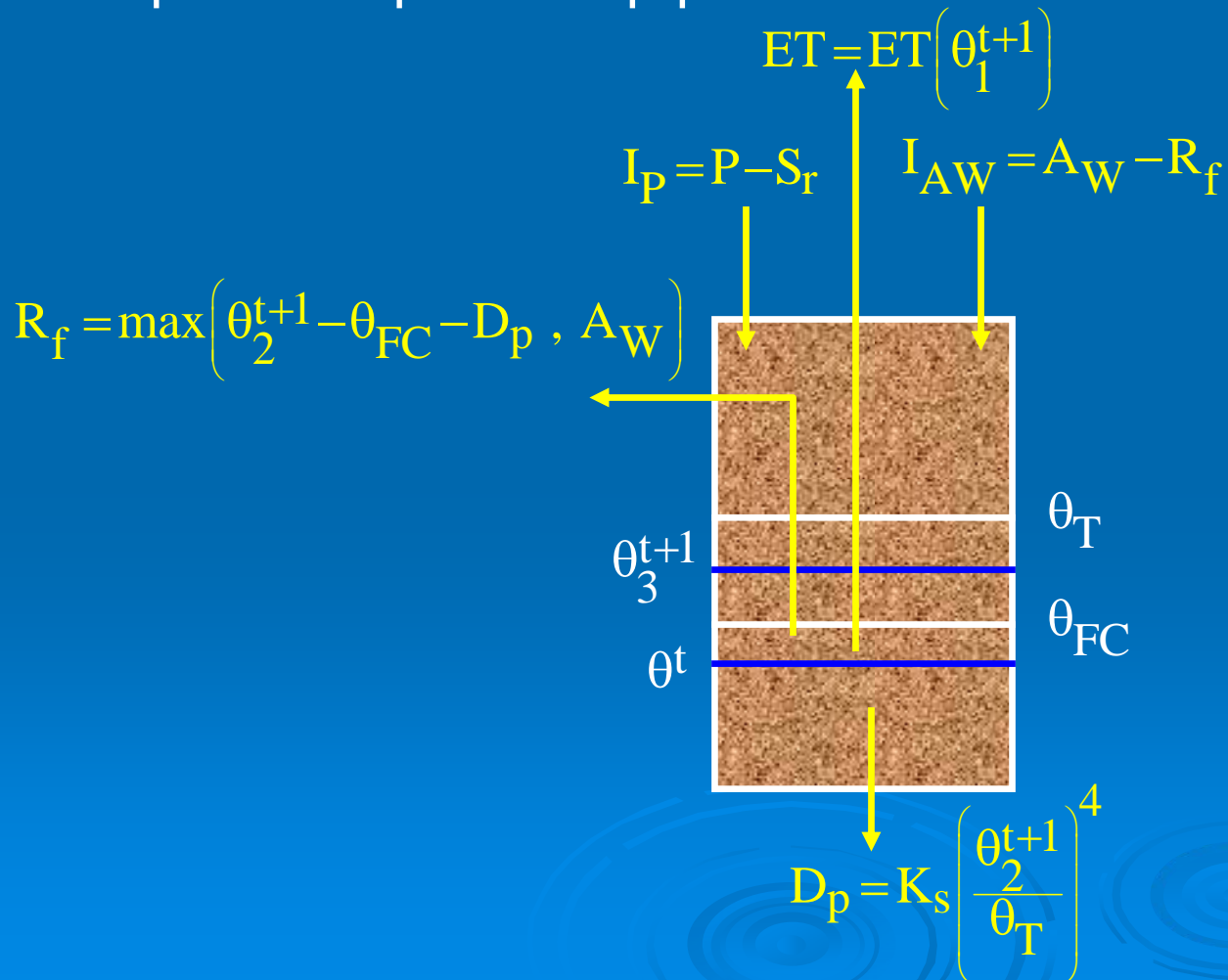
Modified Root Zone Scheme in IWFM v2.4 (continued)

Step 2: Compute ET



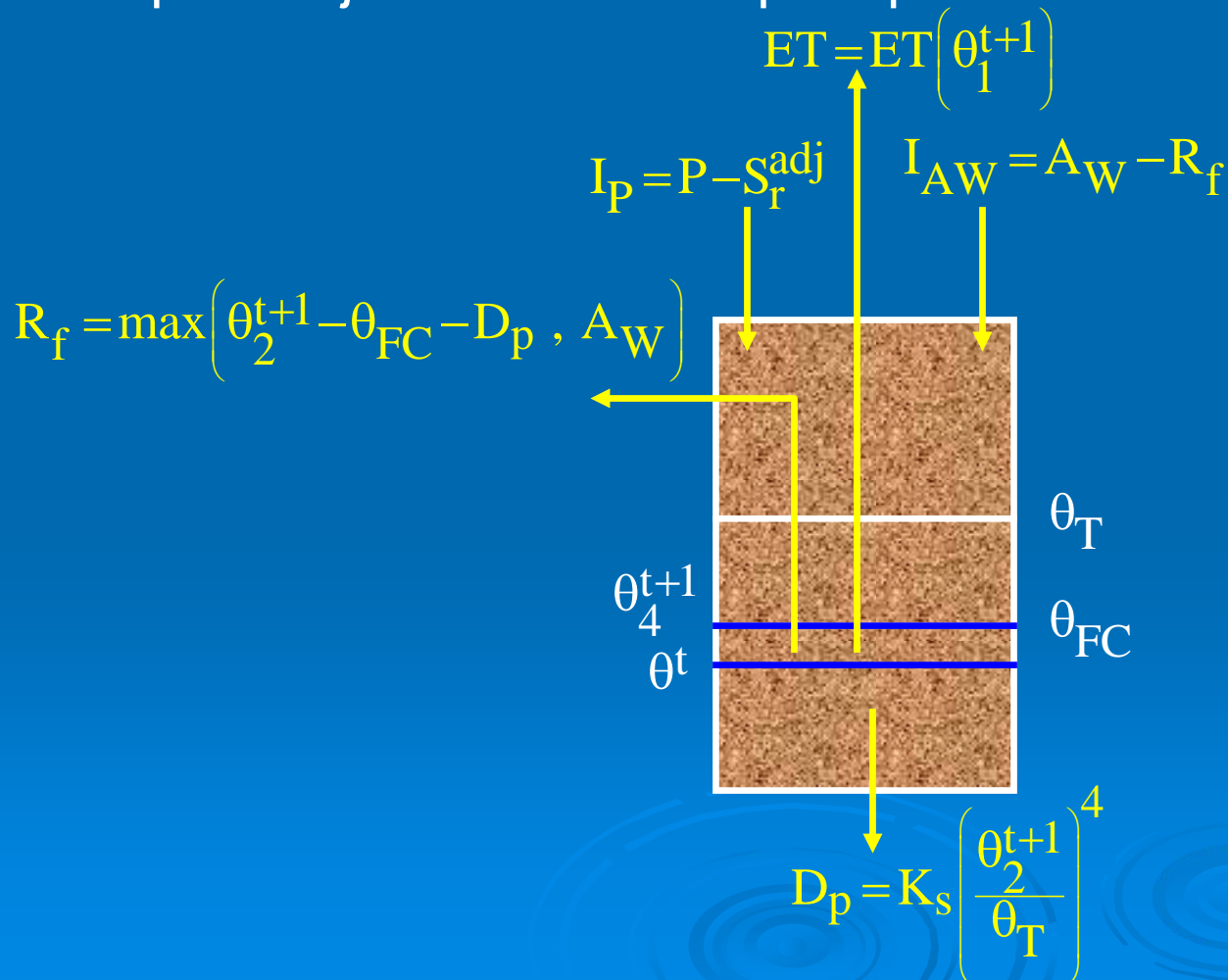
Modified Root Zone Scheme in IWFM v2.4 (continued)

Step 3: Compute deep percolation and return flow

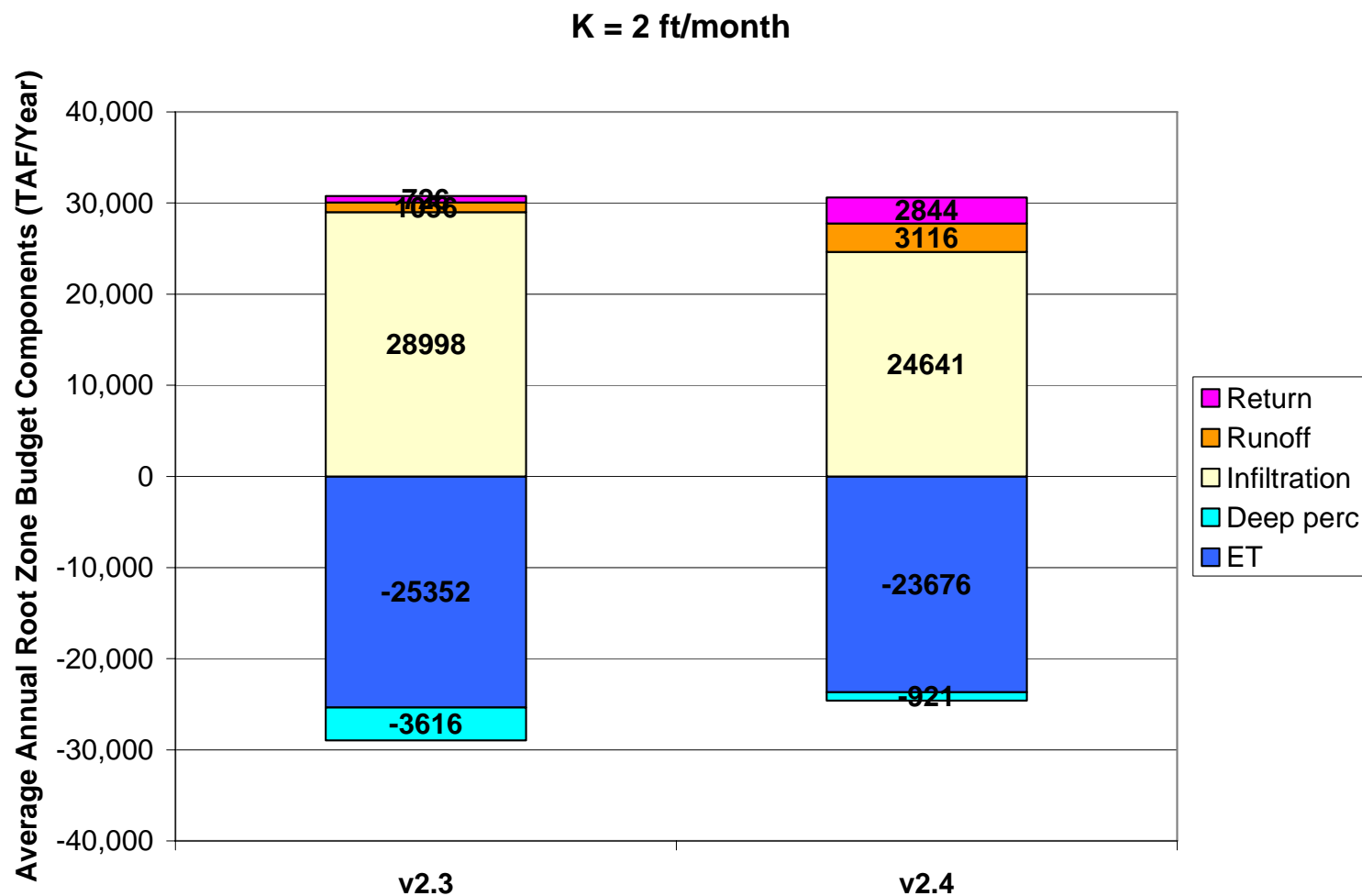


Modified Root Zone Scheme in IWFM v2.4 (continued)

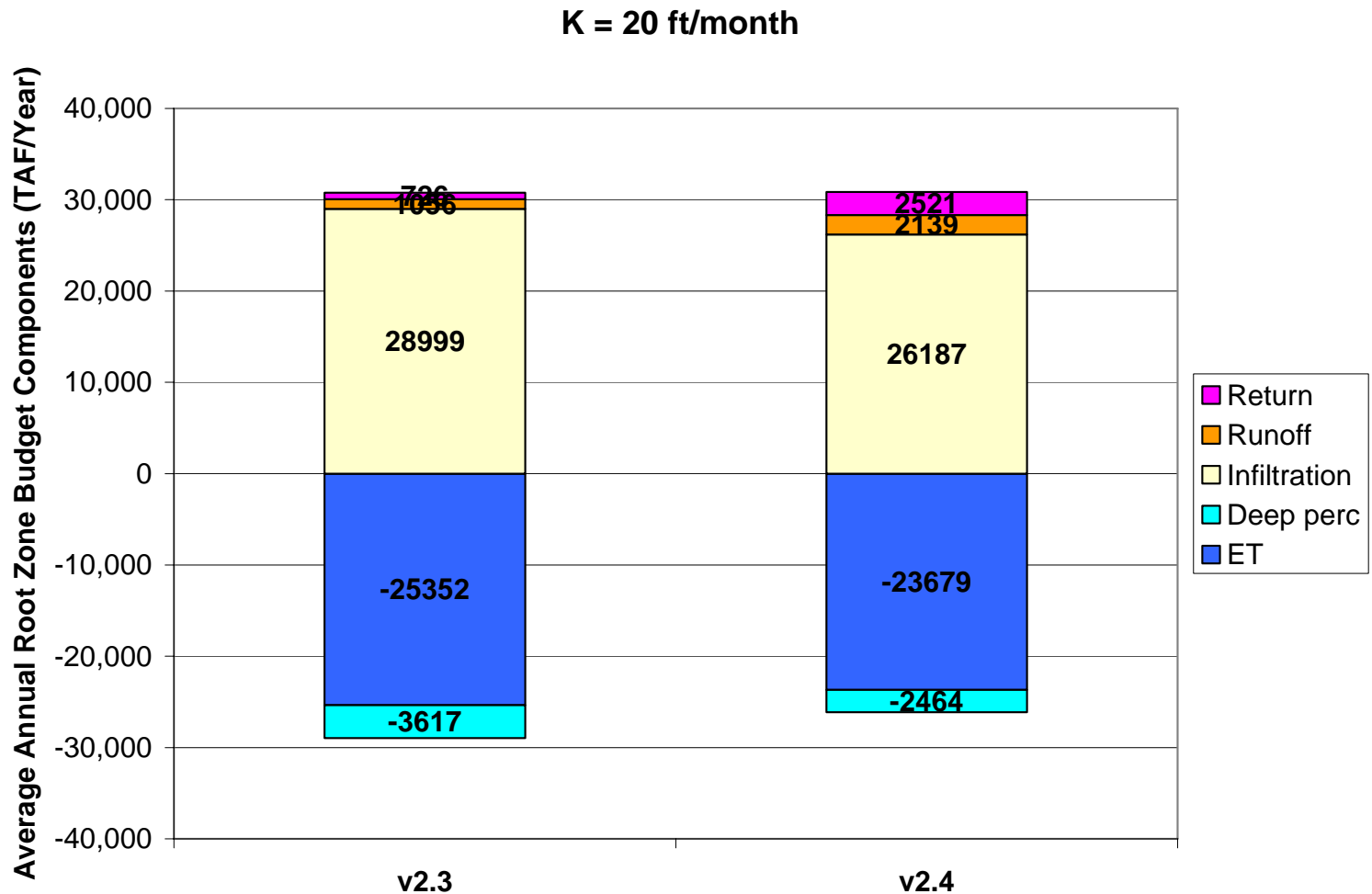
Step 4: Adjust runoff from precipitation if necessary



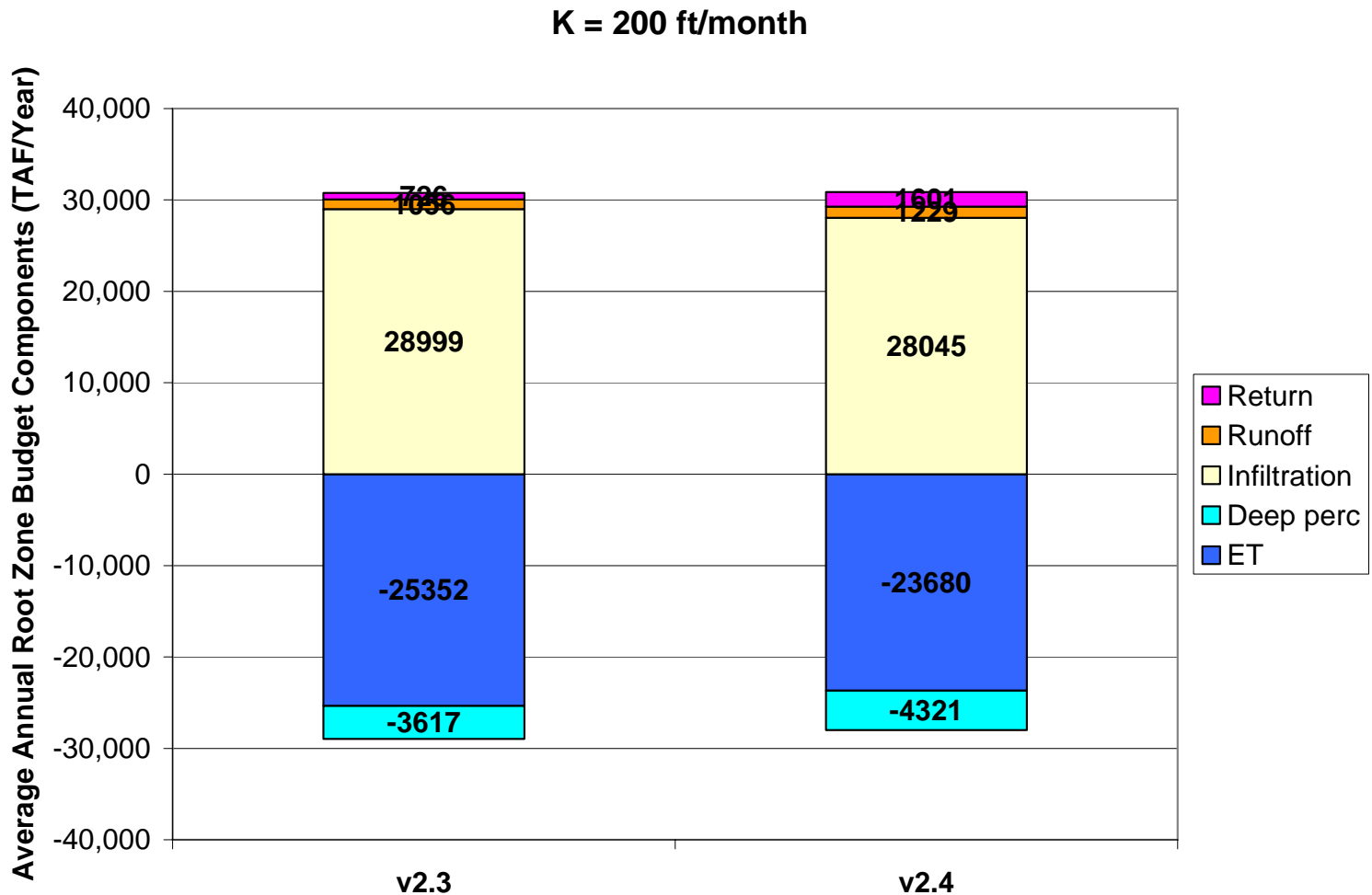
Comparison of IWFM v2.3 and v2.4



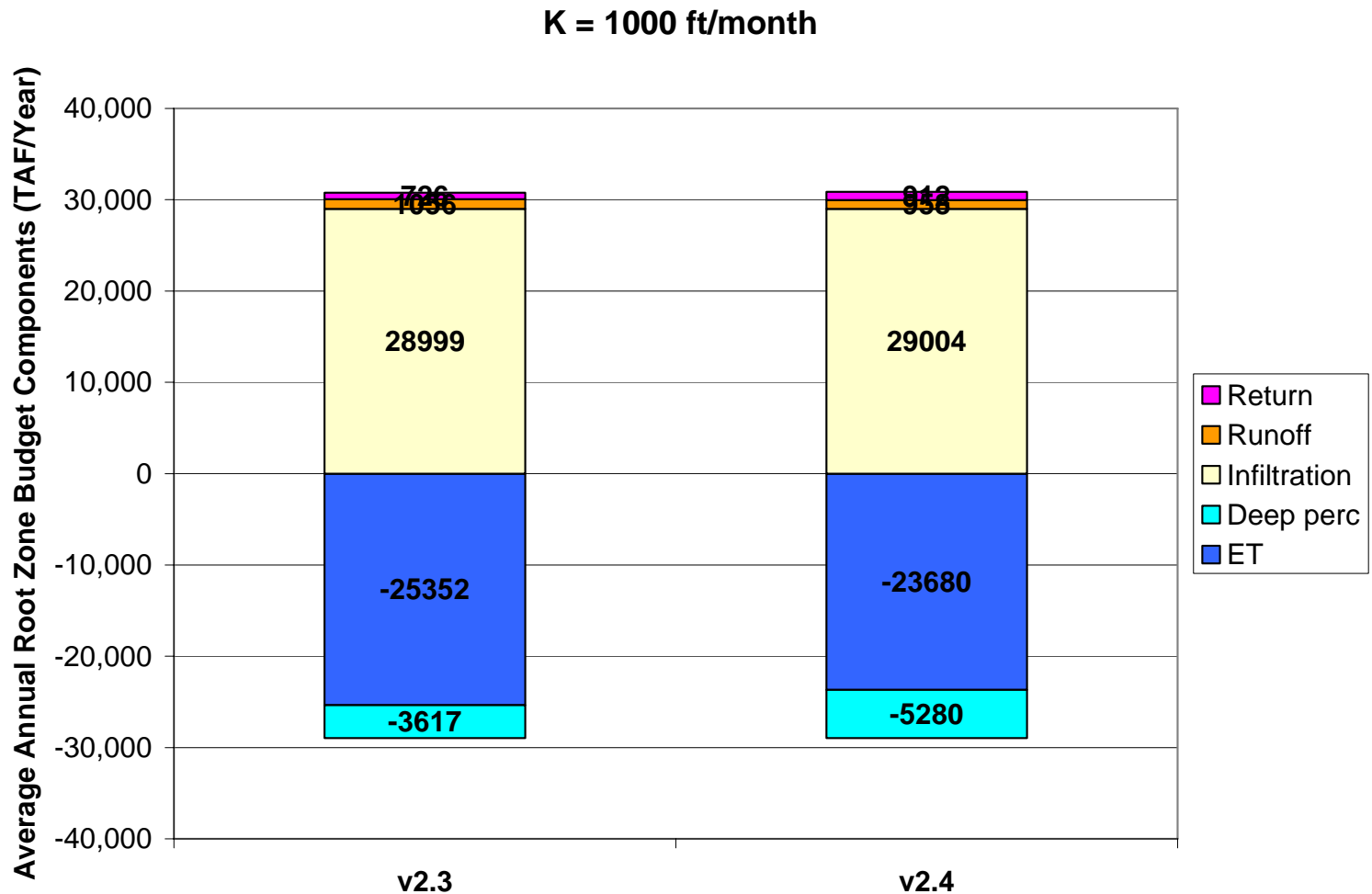
Comparison of IWFM v2.3 and v2.4 (continued)



Comparison of IWFM v2.3 and v2.4 (continued)



Comparison of IWFM v2.3 and v2.4 (continued)



Conclusions

- The new root zone moisture routing scheme is sensitive to soil hydraulic conductivity. This allows the user to increase or decrease the recharge to groundwater
- The new scheme has been incorporated into IWFM v2.4 which is available for download at <http://modeling.water.ca.gov/hydro/model/iwfm/download.html>
- The same input files for IWFM v2.3 can be used with IWFM v2.4 without any change

